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OM-SLP
REV. 9
06/07/19

Owner's Manual

Synthetic Plasma® Long Lines



PROPRIETARY

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SUBJECT

OWNER'S MANUAL SYNTHETIC PLASMA[®] LONG LINES

REPORT

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DETAILS OF REVISIONS

REV.	DATE	PAGE	DESCRIPTION	APPROVED
3	04/01/09	7 8	Updated Section 2.0 Added Section 2.8 Revised Formatting	P. Bravo
4	10/26/12	All	Changed company logo.	Williamson
5	04/17/14	All	Changed company logo.	Williamson
6	01/16/15	All	Added Introduction Updated Photos	Williamson
7	8/9/16	14	Revised Section 3.9	Gilbert
8	1/6/17	11	Revised Section 3.8	Gilbert
9	06/10/19	11	Revised Section 3.8	Tailor

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SECTION 1.0: INTRODUCTION

The purpose of this document is to provide the customer with instructions for care and inspection of P-XXXX Dart Aerospace Long Lines. For DALL-#-#-#-# Dart Aerospace Long Lines please refer to CMM-T-0001.

1.1 KEY BENEFITS

Dart Aerospace Long Lines are constructed from high quality materials and are designed for ease of use.

- Patented manufacturing process
- World's strongest rope for its weight
- 8 Times lighter and 20% stronger than wire rope & does not kink
- Max. elongation is 4% - 5% (stretch)
- Chemical resistant: fuel, Hydraulic oil, etc.
- Highest Strength, lowest stretch
- Standard Long Lines are "Fully Dressed" and flight ready
- Years of proven field experience
- 7:1 Safety Factor

1.2 KEY FEATURES

Each Fully Dressed Long Line includes: Plasma[®] rope, POV Orange Velcro jacket with End Returns, Blue Line Thimble with Epoxy Coating at each end, 14 gauge 3 wire electrical wire with a 5 ft. pig tail and 3 prong connectors installed at each end, and a carry bag.

Each Long Line is spliced and pre-stretched, ID tagged, and includes a Component Release Certificate issued from our manufacturing facility.

Every Long Line is Pull Tested to 3 times the WLL (working Load Limit), ensuring the rope is "set" and proof loaded.

Long Lines ship with an owner's manual that includes inspection/maintenance recommendations.



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1.3 Plasma[®] ROPE

Patented Plasma[®] Fiber:

Plasma[®] is manufactured from High Modulus Polyethylene (HMPE) that has been enhanced by Cortland's patented recrystallization process.

Patented 12 x 12 Construction:

This patented design from Cortland allows for long lay lengths, making rope that is more flexible for bending applications, easy to inspect, and easy to splice using standard 12 strand splicing techniques. This construction is especially effective in medium to large diameter ropes because it creates high strength translation efficiency for larger ropes.

1.4 VELCRO JACKET

Velcro jackets are constructed with two separate pouches, one pouch for rope and one pouch for electrical cable, which allows for easy inspection and mitigates damage from UV rays, wear, and dirt. Jackets are made from durable fabric and commercial grade hook and loop fasteners. In-house manufacturing ensures correct sizing of jacket and end covers.

1.5 THIMBLES

Blue Line thimbles provide better protection over regular galvanized thimbles.

1.6 ELECTRICAL WIRE

Fully Dressed Dart Aerospace Long Lines use SJTOW, 300 Volt, 14 gauge 3 wire, FT2 flame rating, -60°C to 60°C. An additional 5 ft. of wire is provided at each end for a total of 10 ft. per Long Line.

- CSA File Number: LL39965
- UL File Number: E67474



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1.7 STANDARD LENGTHS & CUSTOMIZATION

Dart Aerospace Long Lines are offered in a variety of standard lengths and configurations but are fully customizable; including adapting Long Lines for use with Water Buckets. For additional customization options, contact our sales department:

1270 Aberdeen St.
Hawkesbury, Ontario, Canada
K6A 1K7

1 800 556-4166 or 1 613 632-3336

Fax 1 613 632-4443

Email: sales@dartaero.com

1.8 STANDARDS MET

Dart Aerospace Long Lines meet the following standards:

- U.S. Dept. of Interior ARA Synthetic long line requirements
- Adheres to CARS and FARS regulations for Class B and Class C external load operations
- Cordage Institute recommendations
- For P7300:
 - Conforms to Dept. of Army AWRs

SECTION 2.0: LONG LINE CARE AND INSPECTION

A regular inspection cycle should be established to determine the condition of the rope. The following conditions should be looked for:

- Kinks or Twists
- Heavy chafing or seriously worn surface areas
- Cut, broken or frayed strands (outer and inner strands)
- Evidence of chemical exposure
- Compacted or hard areas of rope
- Splice movement

Although visual inspection of your rope can not accurately predict the residual strength, it does indicate problem areas that may need attention. If any of the above conditions exist or you doubt the strength of the rope, an analysis of the safety factor ratio should be conducted.

2.1 HEAT

Heat has a direct effect on the ropes tensile strength. All synthetic ropes are affected by heat to some degree. Rope strength can be seriously decreased by heat exposure. The critical temperature of rope is the temperature at which 50% strength loss can occur. The critical temperature of HMWPE type ropes is only 150° F, and melting temperature is 297° F. Critical temperatures for other types of rope are: Polypropylene 250° F, Kevlar 400° F, Nylon 350° F, Polyester 350° F.

2.2 CHEMICALS AND DIRT

Chemicals and dirt can cause damage to rope. Keep ropes away from acids, bleach and solvents. Laundry detergent can also weaken the rope, and ropes should only be rinsed if cleaning is needed. Grit, mud, dirt and sand can work into the rope fibers and cause deterioration. It is difficult to inspect for any debris that has worked its way inside the ropes fibers. It is important to keep the rope clean.

2.3 ULTRA VIOLET RADIATION

Ultra violet radiation damage is most commonly found when the rope is exposed to direct sunlight. The effect of UV exposure varies with the fiber type, protective coatings, rope size and rope construction. The larger the rope the less effect UV has on the strength since the UV radiation is absorbed in the outer layer. For the same reason jacketed ropes or ropes with surface coatings will retain their strength better. UV degradation is usually more a problem of improper storage than of use conditions.

2.4 STORAGE

In addition to keeping the rope away from heat, ropes should be stored clean and dry, and out of direct sunlight. Helicopter synthetic long lines should be stored in a rope bag away from batteries and chemicals. If ropes are wet, ideal storage is off the floor on racks to provide ventilation. Never store rope on concrete or dirty floors. Grit from dirt can abrade and weaken rope fibers. Acid is often used in concrete work and can remain on the surface. Abrasive surfaces should also be avoided. Never step on rope, drive over rope or allow the helicopter to land on the rope. If any of these occur, inspect the long line for damage and enter the event in the rope log.

2.5 SHOCK LOADS

Shock loads are simply a sudden change in tension from a state of relaxation or low load to one of high load. Any sudden load that exceeds the workload by more than 10% is considered a shock load. The further an object falls, the greater the impact. Since synthetic fibers have a memory, the effects of shock loading remain with time and can result in failure even when loaded within the normal range. Any shock noticed by the pilot or crew should be recorded in the rope log.



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SECTION 3.0: LONG LINE RE-CERTIFICATION AND RETIREMENT

There are neither definite rules nor industry guidelines to establish when a long line should be retired; therefore, long line retirement shall be based on condition as specified in the following sub-paragraphs. After each use, look and feel along every inch of the line length inspecting for damage.

NOTE: According to the United States Forest Service, the manufacturer's recommended maintenance and inspection procedures shall be complied with.

3.1 ABRASION.

When the long line is first put into service the outer filaments of the rope will quickly fuzz up. This is the result of these filaments breaking and this roughened surface actually forms a protective cushion and shield for the fiber underneath. This condition should stabilize not progress. If the surface roughness increases, excessive abrasion is taking place and strength is being lost. As a general rule for braided ropes, when there is 25% or more wear from abrasion the long line should be retired from service.

3.2 COMPACTED

Long line ropes become hard or compacted when heavily used. Any long line rope that has become hard or compacted indicates reduced strength and should be discarded.

3.3 HEAT DAMAGE

Glazed or glossy areas indicate damage and decreased strength. Even normal looking fibers adjacent to the visibly heat damaged areas have been damaged.

3.4 INCONSISTENT DIAMETER

Inspect flat areas, bumps or lumps. This can indicate core or internal damage from overloading or shock loads and is usually sufficient reason to replace the long line.



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3.5 DISCOLORATION

All long lines will get dirty. Check for unusual discolorations that could indicate chemical contamination. Determine source of contamination and replace the long line if the rope is brittle or stiff.

3.6 SPLICE MOVEMENT

Unacceptable splice slippage would be approximately 2" maximum.

3.7 LONG LINE INSPECTION CHECK LIST

Inspect the inside of the Plasma[®] rope at intervals of 30 feet. Open the protective jacket and inspect the rope by placing your thumbs approx. 3 inches apart and push together. The rope will open inside; look for broken strands, flattening or spots that may look shinny. These are indications of heavy usage and wear, at this point the rope should be returned for re-certification.

If any of these conditions are met, discard the long line.

CONDITION – For Synthetic Plasma[®] 12 Strand Rope

1. Original rope bulk reduced by abrasion; by 25%
2. Fiber strands cut; by two or more adjacent strands cut
3. Diameter inconsistency; localized dia. reduction, flat areas, lumps or bumps in rope
4. Glossy or Glazed fiber; localized or extended areas
5. Inconsistency of texture; localized or extended areas of stiffness
6. Discoloration; localized or extended areas caused by chemical contamination
7. Splice slippage; maximum 2"



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Use your discretion on the following;

THIMBLES

Look for wear and tear, such as cracks. Thimbles may be replaced.

EPOXY COATING

Polyurethane coating will peel or wear with time. The coating may be re-applied.

WIRING

Check for loss of conductivity or worn wires. Wiring may be replaced.

LONG LINE PROTECTIVE JACKET

Look for tears, rips, holes, wearing of material, and Velcro separation from jacket. The jacket may be replaced.

3.8 LONG LINE RE-CERTIFICATION

DART Aerospace Long Line must be taken out of service after a maximum of 5 years from the Entry Into Service (EIS) date.



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3.9 LIMITED WARRANTY

Dart Aerospace warrants to the original customer and or owner, that the product will be free from defects in workmanship and materials, under normal use and services for which each product is intended for the warranty periods listed below from the date of delivery. Warranty shall be granted provided the product has been transported, stored, protected, unloaded, maintained and operated strictly in accordance with Dart Aerospace's instructions and/or manuals and that no unauthorized repairs have been attempted. The Dart Aerospace warranty stated herein is intended for new products and aftermarket services sold through Dart Aerospace or its Subsidiaries (Authorized Service Centers or Authorized Distributors). Internal components installed and manufactured from other manufacturers are not covered by Dart Aerospace and are subject to OEM warranties. Dart Aerospace reserves the right to evaluate the product and determine if the unit is subject to warranty.

New Product Sales:

The period of warranty for new product sales is One (1) calendar year from the date of delivery to the customer.

Services:

The period of warranty for Repair, Overhaul, or Exchange Services is Six (6) calendar months from the date of delivery to the customer.



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4.1 DAILY LONG LINE INSPECTION

Prior to use:

- Visual inspection of the protective jacket should include looking for nicks, cuts, tears, or that the POV cover (polyester material) has been flattened or squashed.
- Visually check the thimbles for any damage, check the rope splice and the portion of the rope, which is inside the thimble, at both ends. Ensure that the epoxy protective coating is in place.

CAUTION: Keep the long line away from solvents, gas, diesel fuel, dirty water, saw dust and any foreign materials that may damage the rope.

Never wash the rope or cover with “orange” soap (Liquid detergent).

DO NOT wrap or tie tape or adhesive products directly to the Synthetic Plasma[®] rope.

Coil your long line in a Figure 8, one circle on top of the other, for storage.



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I CHEMICAL RESISTANCE CHART FOR Plasma®

Strength Retention After Chemical Immersion		
	Plasma®	
	6 Months	2 Years
Sea Water	100%	100%
Hydraulic Fluid	100%	100%
Kerosene	100%	100%
10% Detergent Solution	100%	100%
Gasoline	100%	100%
Toluene	100%	96%
Glacial Acetic Acid	100%	100%
1M Hydrochloric Acid	100%	100%
5M Sodium Hydroxide	100%	100%
Ammonium Hydroxide (29%)	100%	100%
Perchloroethylene	100%	100%
Clorox Bleach	91%	73%

II TENSILE STRENGTH CHART (STANDARD SIZES)

Plasma® Tensile Strength								
Nominal Diameter		Size (circ in.)	Approximate Weight		Minimum Tensile Strength Spliced Rope		Minimum Tensile Strength ISO Unspliced Rope	
Inch	MM		Lbs./100'	Kg/100m	Lbs.	MT (tonnes)	Lbs.	MT (tonnes)
7/16	11	1-1/4	4.2	6.3	21,000	9.5	23,400	10.6
1/2	12	1-1/2	6.4	9.5	31,300	14.2	34,800	15.8
9/16	14	1-3/4	7.9	11.8	37,900	17.2	42,100	19.1
5/8	16	2	10.6	15.8	51,400	23.3	57,100	25.9
3/4	18	2-1/4	13.3	19.8	68,500	31.1	76,300	34.6
7/8	22	2-3/4	19.6	29.2	92,600	42.0	102,900	46.7

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III ADDITIONAL TECHNICAL INFORMATION

Plasma [®] Technical Information	
Specific Gravity	.98
Melting Point	284°F (140°C)
Critical Temp.	150°F (65°C)
Coefficient Of Friction	.09-.012
Elongation At Break	4%-5%
Fiber Water Absorption	0%
UV Resistance	Moderate
Wet Abrasion	Superior
Dry Abrasion	Superior

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